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The Association of Training with Computer Self-Efficacy

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CHAPTER 1

INTRODUCTION

Futurists predict in the next century that lifelong learning will become the established norm (Snyder, 1987; Toffler, 1970). In today's society the term *illiterate* takes on a new definition. Toffler (1970) wrote "Tomorrow's illiterate will not be the man that can not read: he will be the man who has not learned to learn" (p. 367).

To survive in today's culture, one must have some knowledge of the computer. We see the computer being accepted in the common workforce. Our children within the school systems are using it. Four-year old children are instructing older persons on how to access the Internet. Times have changed and without progression in one's learning, a person can become impaired.

With the adoption of advanced technologies occurring swiftly in everyday life, being behind the times can be extremely destructive for a person. Snyder (1987) stated by the end of the 20th century "one-fourth of the U.S. work force will be required to change careers and another 25 percent will have to be substantially retrained on the job" (p.92). This statement alone emphasizes the need for training programs to be in place. Moreover, the training programs need to be focused on the betterment of the individual's skills both in today's workforce and that to come.

Learning a new skill can be terrifying to most people. When forced to exercise a new task unfamiliar to a person, this can cause many negative effects. Some people will simply refuse to learn the new task resulting in job loss or some other form of penalty. Others may use it apprehensively causing an increased level of anxiety. Whereas, others may choose to accept the additional task and make the best of it. Training programs have been developed to aid people in the acceptance of new skills. There are training programs ranging from orientation to a new corporation to distinct instruction on skills one may utilize in the everyday workforce. These programs assist in strengthening one's self-efficacy beliefs regarding the proficient use of skills on the job. Application of skills tends to affect one's job performance.

Self-efficacy refers to beliefs concerning one's capabilities to learn or perform behaviors at designated levels (Bandura, 1977). The construct of self-efficacy is thought to be a fluid one, changing over periods of time as new information and experiences are acquired (Gist & Mitchell, 1992). Bandura (1977) describes the formation of self-efficacy as a dynamic process involving self-referent thought, affect and actions. Self-efficacy beliefs are influenced by two factors: (1) one's cognitions, and (2) the various sources of information perceived by the individual while performing a task.

Self-efficacy results from cognitive appraisals of the relationship between an individual and experiences from the environment. Moreover, the individual focuses on his/her values, commitments and perceptions and how they relate to the environmental experiences. Sensory information that the person receives is subject to the person's cognitive appraisal some of which in turn determines perceived efficacy (Bandura, 1986).

For example, perceived success at a task does not mean an increase of efficacy if the experience is perceived to be due to luck. Nor, does one failure in a series of successes result in a decrease of self-efficacy. Information from cognitive assessments of successes or failures do not influence self-efficacy alone. The following sources of efficacy information also play a major role in determining the outcome of the self-efficacy belief. Both cognitions and sources of information combined influence the development of self-efficacy beliefs.

Information from four sources is combined to develop unique self-evaluation of capability: enactive mastery, vicarious experiences, verbal persuasion, and physiological state. The information from the four major sources is combined to generate an appraisal of one's efficacy.

Enactive mastery, actually performing a behavior, is the most influential source. It is the most reliable source of efficacy information for two reasons: (1) it is based on direct, personal experiences, and (2) mastery is most often attributed to one's own skill. Personal successes will tend to raise self-efficacy, whereas, repeated failures tend to lower it (Bandura, 1986).

Another source of efficacy information is vicarious experience. If other people can do it, so can I. This information is acquired through observations of others performing a behavior, or modeling. This form of experience is weaker than enactive mastery; however its influence is still significant. "Seeing or visualizing other similar people perform successfully can raise self-percepts of efficacy in observers that they too possess the capabilities to master comparable activities" (Bandura, 1986, p.399). The

effects of modeling are particularly relevant when the individual has little prior experience with the task. Bandura argued that "even the self-assured will raise their perceived self-efficacy if models teach them better ways of doing things" (Bandura, 1986, p.400). The impact of the observation is intensified if those observed are similar in relevant characteristics to the observer.

Verbal persuasion is a source of information provided by others (i.e. teachers and parents) stating the performer is capable of learning or performing a specific task. Positive feedback enhances self-efficacy, but this increase is temporary if the efforts turn out poorly. Bandura (1986) states it is easier to undermine efficacy beliefs by means of verbal persuasion than to enhance or create them. Verbal persuasion tends to be used in conjunction with enactive mastery.

One's physiological state is also a source of efficacy information. An increase in heart rate, sweating or other symptoms signaling anxiety might be interpreted that one lacks confidence in his/her skills. People are more likely to achieve success when they experience low levels of arousal; however high levels of arousal interfere with performance and conjure up further feelings of one's vulnerability (Bandura, 1986).

All the information that individuals use to measure their sense of efficacy must be processed and interpreted. Once the information is cognitively appraised by the individual, it results in patterns of behavior (Bandura, 1986). Upon determining the concept of self-efficacy, it can be extremely influential in achieving certain tasks and behaviors.

A person's self-efficacy is extremely influential in developing new skills (Hill, Smith, & Mann, 1987). The decision to become trained on a new skill or to seek out another job position may be influenced by the person's self-efficacy. The construct of self-efficacy was first introduced in the Social Cognitive Theory, developed by Albert Bandura. Bandura's (1977b, 1986) theory presents a model of interaction referred to as triadic reciprocality. This model states that there is a three way interaction between a person's cognitive and personal factors, the individual's behavior, and the environment. Furthermore, there is a two way interaction between each of the component parts. This is not to say that there is equal strength in the bi-directional influences, nor it is necessarily so that the influences occur simultaneously (Bandura, 1986). Social Cognitive Theory "neither casts people into the role of powerless objects controlled by environmental forces nor free agents who can become whatever they choose. Both people and their environments are reciprocal determinants of each other" (Bandura, p.vii). Social Cognitive Theory recognizes that humans are intelligent, problem-solving individuals who strive to understand the situations that surround them and who control their environments to suit their own purposes. Bandura states that individuals possess beliefs that enable them to exercise a measure of control over their thoughts, feelings and actions, that "what people think, believe, and feel affects how they behave" (Bandura, 1986, p.25).

Social Cognitive Theory indicates three major types of learning experiences that result in individual behavioral and cognitive skills that allow one to function effectively in one's environment. Instrumental learning experiences, or self-regulatory influences

occur when the individual is positively reinforced or punished for some behavior. Individuals tend to repeat behaviors for which they are positively reinforced. Moreover, they become increasing adept at the skills involved. Individuals tend to avoid behaviors for which they are punished. They often learn to dislike performing these behaviors. People have control over their own behavior.

The second type of learning experience is associative learning experience, or symbolic processing. These experiences occur when individuals associate some previous event or stimulus with a current emotional event. This processing capability of humans make them unique.

> [It is] the extraordinary capacity of humans to use symbols [that] enables them to represent events, to analyze their conscious experience, to communicate with others at any distance in time and space, to plan, to create, to imagine, and to engage in foresightful action. (Bandura, 1977b, p. vii)

Instrumental and associative learning experience occur through direct experience with reinforcing or punishing events.

The third type of learning experience is vicarious experience, or modeling. As discussed previously, people can learn new behaviors simply by observing the behaviors of others.

It is these concepts of learning experience in conjunction with the belief of self-efficacy and its formation that will provide the framework for this thesis research. Bandura (1986) stated, "self-efficacy is an important motivational contributor to the attainment of further competencies and success" (p. 417). Self-

efficacy can be developed. Training programs can contribute to the development of one's self-efficacy.

More specifically, the concept of computer self-efficacy, or an individual's beliefs about the abilities to competently use a computer, will be analyzed. The more efficacious a person feels about his/her computer aptitude, the more willing s/he will be to demonstrate the computer skills by use. The main purpose of this study is to test whether computer training has an effect on computer self-efficacy beliefs of corporate employees. The study examines various training methods focusing on the transformation in the subject's computer-self-efficacy beliefs. It is hypothesized that instructor-led training will be associated with significant changes in computer self-efficacy when compared to self-directed training and a no-training comparison group.

CHAPTER 2

LITERATURE REVIEW

An overview of Bandura's Social Cognitive Theory was presented previously in the document. Self-efficacy is thought to be fluid. The judgments of one's capability for performing a specific task are considered to be particular based on each situation (Murphy, Coover, & Owen, 1988). The construct of self-efficacy first introduced in the Social Cognitive Theory has been examined in many ways. This chapter will focus on how self-efficacy has been studied as applied to the computer arena. There are two distinguishable methods of study relating to self-efficacy and computers. One line of study focuses on how education, or more specifically training affects one's computer self-efficacy (Ertmer, Evenbeck, Cennamo, & Lehman, 1994; Gist, Schwoerer & Benson, 1989; Smith, 1989; Torkzadeh & Koufteros, 1994). The second line of study emphasizes the role of self-efficacy as an influence in performing behaviors such as utilizing computers (Hill, Smith & Mann, 1987; Martocchio, 1994).

James Smith (1989) examined the effects of technical classroom instruction on self-efficacy beliefs. The objectives were threefold: a) to examine the relationship between classroom instruction on computers and task self- efficacy (TSE); b) to examine the relationship between classroom instruction and

generalized self-efficacy (GSE); and c) to determine the differences in self-efficacy beliefs between sexes on TSE and GSE. The results provided support for the hypothesis that classroom instruction increased self-efficacy towards using and learning about computers. There were no significant differences between the two subgroups: a) standard instruction group and b) verbal persuasion group. However, gender differences occurred between females enrolled in the computer class scoring significantly higher or equal to their male counterparts, and females in the comparison group scoring significantly lower than their male counterparts. This study supported Bandura's (1986) concept that an environment can enhance self-efficacy.

In the past, there has been little research conducted on the effectiveness of various approaches to computer training. Self-efficacy had been examined thoroughly, but studies relating it to computer training were few. Marilyn Gist, Catherine Schwoerer and Benson Rosen (1989) were among the first to study alternative training methods. Their study was designed to compare a behavioral modeling approach to a tutorial training approach. A video-taped model demonstrated the behavior in the first group. After each step was demonstrated, the video was stopped and the trainees were allowed time to repeat the step. Feedback was given on whether the task was executed correctly or not. In the tutorial training, visual instruction was on the computer monitor. The participants were told what to do but there was no modeling of the steps (i.e. "tell" v. "show and tell"). After training , both groups were given timed tasks to be used for evaluation of

computer self-efficacy. The modeling training was found to yield a higher performance level, more positive work styles, less negative affect after training , and greater satisfaction overall with the training. This study did provide a significant outcome related to behavioral modeling. The conclusion discussed the importance of training people to use computer technology. Gist, Schwoerer & Rosen (1989) accented the fact by stating: "Businesses are already spending 40% of their investment dollars on computers, double their 1978 level" (p.890).

In 1994, Peggy Ertmer, Elizabeth Evenbeck, Katherine Cennamo and James Lehman organized a study to explore how perceptions of self-efficacy might be enhanced over the course of a semester. The study was conducted on college students in a computer applications in a physical education course. It involved novice computer users in hands-on experiences followed by positive feedback from the instructor. Most of the research to this date had not been conducted in the actual classroom. Their study stressed the importance of students being involved in computer experiences in order to prepare themselves for a computer-dependent society. "According to Holzinger (1992), a computer-literate individual is one who naturally turns to the computer as a problem-solving tool of choice and leadership." (Ertmer et al, p. 45).

The students were given a survey to complete which was divided into three sections: a) demographics, b)attitudes toward computer technologies, and c) self-efficacy with computer technologies. The survey was divided into subscales to obtain a measure for self-efficacy for specific computer technologies. Experience

was found to be positively related to attitudes towards computers. There was an increase in self-efficacy judgments for students who were engaged in the computer experiences based within a non-threatening learning environment. This study supported Bandura's (1977) statement that performance accomplishment, enactive mastery, is the most influential source of efficacy information. Personal success will tend to raise self-efficacy, whereas, repeated failure tends to lower it (Bandura, 1986).

Gholamreza Torkzadeh and Xenophon Koufteros (1994) conducted a study which examined a) the factorial validity of the Computer Self-Efficacy Scale (to be discussed in detail in the next chapter, Methodology) and b) the change in attitudes of undergraduate students in an introductory computer course. The attitudinal responses displayed the impact of computer training on computer self-efficacy. Results indicated an influence of training on computer self-efficacy for all factors (beginning, mainframe, advanced, file management).

It is evident that the type of training one receives will influence the level of self-efficacy. Also, the type of learning environment will affect the level of self-efficacy. All of these studies focus on how education affects one's computer self-efficacy. We will now change our direction to examine the studies that discuss the role of self-efficacy in adopting specific behaviors such as utilizing computers.

In 1987, Thomas Hill, Nancy Smith and Millard Mann tested the relationship between people's expectations of being able to control computers and their decision to use them. It was predicted that the more controllable computers

are believed to be the more likely people are to use them. This was based on Bandura and his associates' (Bandura, 1977; Bandura & Schunk, 1981) role of (lack of) personal efficacy in performing behaviors. A questionnaire was given to undergraduate students in an introductory psychology course. It was designed to access efficacy beliefs with respect to computers, items to measure beliefs about the instrumental value of learning about computers, and items to measure intentions to purchase or use computers.. The results showed that computer self-efficacy beliefs made a significant contribution to the prediction of intentions to learn to use computers. It supported self-efficacy beliefs as having an impact on the use of computers. These findings were later used by Gist, Schwoerer and Rosen (1989) when discussing how trainees with high self-efficacy may experience greater success in training than those with low self-efficacy.

Drawing from the Social Cognitive Theory, Joseph Martocchio (1994) conducted a study comparing the concept of ability to be either an acquirable skill or fixed entity. It was predicted that individuals who believed ability to be an acquirable skill are likely to view training tasks as an opportunity rather than a threat. These beliefs would lower anxiety and cause greater self-efficacy which, in turn, would lead to enhanced learning (Martocchio, 1994). Trainees in the acquirable skill condition experienced a significant decrease in computer anxiety; however, trainees in the entity condition did not experience a significant change in computer anxiety. Also, trainees in the acquirable skill condition experienced a significant increase in computer self-efficacy beliefs and trainees in the entity

condition experienced a significant decrease in computer efficacy. This research supports the adoption of computer use with an increase in computer self-efficacy beliefs and a decrease in computer anxiety.

The research to date is extremely influential in the development of the current study. Employing the review of literature on self-efficacy, Social Cognitive Theory, how training affects self-efficacy beliefs, and the influence of self-efficacy on performing behaviors specific to computer use. It is hypothesized that instructor-led training will be associated with a significant change in computer self-efficacy when compared to self directed training and no training.

CHAPTER 3

METHODOLOGY

The design for this study was a non-equivalent control group quasi-experimental design. Two experimental groups and one control group were used. The first experimental group was comprised of students who attended a computer training course led by an instructor, or instructor-led training (IL). The second experimental group was comprised of students who requested specific training manuals, or self-directed training (M). The control group (C) was comprised of randomly selected subjects recruited by distributing surveys through in-house mail. Subjects from the IL and M groups contacted the corporate Education Department to register for training. The criteria to be a part of the control group was to have not received instructor-led or manual training within the past five years.

All subjects were employees of a major corporation based in Chicago, Illinois. A background questionnaire was given to collect demographic data on the sample study (see Appendix C). Information was gathered and coded on the following for all three groups: (1) group assignment, (2) sex, (3) age, (4) education, (5) prior computer experience, (6) level of anxiety for using computers, (7) level of competence for using a computer, and (8) level of motivation for improving

computer skills. Students who received instructor-led or self-directed training were also questioned on (9) what particular class/manual they registered for, (10) how many prior classes taken, and (11) what was the primary reason for taking the course/manual. Data was coded according to a Code Sheet created by the researcher (See Appendix F).

Instrumentation

Two sets of identical computer self-efficacy surveys were distributed to each subject (See Appendix D). Subjects were asked to complete the first set before attending a training session or receiving a course manual. The second set of surveys were to be completed either immediately after attending the instructor-led training or one week after receiving the training manual. Those subjects who were part of the control group were asked to complete the first set of the surveys immediately upon receipt and the second set of surveys one week after receiving the survey (See Appendix E).

The development of the Computer Self-Efficacy survey adapted for this research was based on a similar scale developed by Murphy, Coover & Owen (1989). The Computer Self-Efficacy Scale (CSE) was developed to measure perceptions of capability regarding specific computer-related knowledge and skills. The development of the scale was based on Bandura's theory of self-efficacy (1986) and Schunk's model of classroom learning (1985). Forty-two items originally made up the scale; however, after submission to a panel of five experts who teach computer courses, the scale was reduced to thirty-two items.

The Computer Self Efficacy Survey was developed with specific items taught in the training courses through the Education Department. The original survey was distributed to the supervisor of the department for verification of the computer tasks. Once revised, the survey was divided into four subsections. The first section was designed to measure levels of competence on basic PC skills. The second section focused specifically on Microsoft Word tasks. The third section referred to tasks utilized within the Microsoft Excel spreadsheet program. The fourth section was designed to include tasks used in an email program, more specifically Lotus Notes. All programs were standardized corporate software packages. Each skill item was preceded by the phrase "I feel confident" utilizing a five-point Likert-style format. The students were asked to rate their level of confidence for completing each task.

Surveys were distributed through in-house mail. Subjects were given a set of instructions asking them to participate in this study at their own discretion. They were able to discontinue their participation as any time without prejudice. Subjects were given a pre-addressed stamped envelope and explicit instructions not to provide a return address. The completed surveys were mailed to the researcher's home address.

Data Analysis

Data were analyzed in three ways. First, descriptive statistics were employed on all demographic variables and pre- and post-treatment scores of all three groups. Second, one-way (group) analyses of variance (ANOVA) were run on

demographics of pre-treatment scores to estimate the equivalence of the three groups at the onset of the study. Third, the major hypotheses were then tested using one-way (group) analysis of covariance (ANCOVA) controlling for pre-treatment differences among groups.

CHAPTER 4

RESULTS

Demographic analysis revealed little variation among groups with respect to the categorical demographics. The total sample size was N=130. The sample consisted of 64 males and 66 females. The level of education most prominent in all three groups was Bachelors Degree with Masters Degree falling second in rank. In comparing the two experimental groups, there was an even disbursement of manuals or class registrations across subject; however, in the instructor-led group alone Lotus Notes appeared to be the class with the most students.. Similarly, the two experimental groups most commonly listed the reasons to register for a class or manual as being to learn the software to use the software on the job. (See Table 1).

Ages ranged from 21 to 60. The mean age of each group did not appear to vary greatly: IL=35.8, M=34.75, and C=36.78. The mean level of prior computer experience for all three groups was frequently use, which was classified as about three times a week. The anxiety level of all three groups was also similar. The mean score was 2 on a scale of 1 (not at all anxious) to 5 (very anxious). The rating of level of competence as a computer user was slightly less for the instructor-led group;. however, the level of motivation to improve one's computer skills was slightly higher in the instructor-led group. Finally, the number of prior classes taken.

TABLE 1

General Statistics of Categorical Demographics, by Group

Variable	IL		M		C	
	N	%	N	%	N	%
Sex						
Male	18	40	21	49.23	25	60.98
Female	27	60	23	50.77	16	39.02
Education						
High School	5	11.11	3	6.82	2	4.88
Associates Degree	4	8.89	10	22.73	3	7.32
Bachelors Degree	24	53.33	28	63.64	29	70.73
Masters Degree	11	24.44	3	6.82	7	17.07
Doctoral Degree	0	0	0	0	0	0
Other Professional or Technical	1	2.22	0	0	0	0
Class/Manual Registered For						
Microsoft Word	12	26.67	10	22.73	0	0
Microsoft Excel	14	31.11	16	36.36	0	0
Lotus Notes	19	42.22	15	34.09	0	0
Not applicable	0	0	3	6.82	41	100
Primary Reason for taking Course						
Not applicable	0	0	4	9.09	41	100
To learn software	17	37.78	14	31.82	0	0
Other's suggestion (i.e. manager)	3	6.67	0	0	0	0
To improve skills	6	13.33	10	22.73	0	0
Use in job	18	40	14	31.82	0	0
Job Promotion	1	2.22	2	4.55	0	0
Total	45		44		41	

Notes: IL=Instructor-led, M=Manual, C=Control

could only be measured in the two experimental groups (IL and M). The subjects requesting a manual had taken on average more classes than the subjects registering for a class. The criteria for being a part of the control group was to have not received a manual or instructor-led training on the software topics tested within the past five years.

The differences in the groups can be accounted for due to the nature of the study. Summary statistics were calculated to demonstrate the mean and standard deviation for each non-categorical demographic (See Table 2). An ANOVA was run to test for differences among groups. The variables of age and prior computer experience did not vary significantly among groups; however significant pre-treatment differences were revealed for level of competence, level of motivation, and number of prior classes (see Table 3).

TABLE 2
Summary Statistics of Non-Categorical Demographics, by Group

Variable	IL		M		C	
	M	SD	M	SD	M	SD
Age	35.867	8.612	34.750	8.589	36.780	10.091
Prior Computer Experience	3.1556	0.9990	3.3636	.7499	3.1707	.8632
Level of Anxiety	2.222	1.223	1.909	1.007	2.049	1.182
Level of Competence	3.756	1.004	4.136	.979	3.854	1.152
Level of Motivation	4.3556	.7121	4.4318	.6611	3.7317	.6717
Number of Prior Classes	.6444	1.1110	.8636	.9546	5.000	0.000

Notes: IL=Instructor-led, M=Manual, C=Control

TABLE 3

Results of Non-Categorical Demographics (ANOVA)

Variable	F	df	P value
Age	1.39	2	.254
Prior Computer Experience	1.91	2	.152
Level of Anxiety	.88	2	.416
Level of Competence	3.11	2	.048**
Level of Motivation	18.66	2	.000**
Number of Prior Classes	358.67	2	.000**

*p<.05 **p<.01

Summary statistical tests were organized between each group on five variable totals for pre and post-training: a) General PC Self-Efficacy, b)Word Self-Efficacy, c) Excel Self-Efficacy, d) Notes Self-Efficacy and e) Total Self-Efficacy. These figures were summarized in Table 4 for pre-treatment and Table 5 for post-treatment.

TABLE 4

Summary Statistics of Self-Efficacy Totals Pre-treatment, by Group

Variable	IL		M		C	
	M	SD	M	SD	M	SD
General PC Self-Efficacy	41.311	10.357	43.773	7.938	41.073	9.593
Word Self-Efficacy	116.02	41.96	129.07	31.40	125.32	33.45
Excel Self-Efficacy	94.82	41.32	112.84	33.79	112.39	39.97
Notes Self-Efficacy	114.71	64.99	151.52	49.86	155.51	53.84
Total Self-Efficacy	366.9	145.1	437.2	118.4	434.3	132.5

Notes: IL=Instructor-led, M=Manual, C=Control

TABLE 5

Summary Statistics of Self-Efficacy Totals Post-treatment, by Group

Variable	IL		M		C	
	M	SD	M	SD	M	SD
General PC Self-Efficacy	44.800	6.542	44.636	7.002	41.098	9.586
Word Self-Efficacy	125.40	35.99	132.18	30.35	125.80	33.45
Excel Self-Efficacy	105.60	40.93	116.25	34.26	112.46	39.78
Notes Self-Efficacy	141.40	59.93	155.11	49.45	156.37	53.40
Total Self-Efficacy	417.20	120.2	448.2	114.4	435.7	132.2

Notes: IL=Instructor-led, M=Manual, C=Control

ANOVA tests on pre-training self-efficacy subsections yielded significant differences among groups on Excel, Notes, and Total Self-Efficacy (See Table 6)

TABLE 6

Results of Pre-Training Self-Efficacy Variance (ANOVA), between Group

Variable	F	df	P value
General PC Self-Efficacy	1.11	2	.333
Word Self-Efficacy	1.55	2	.217
Excel Self-Efficacy	7.36	2	.001**
Notes Self-Efficacy	13.38	2	.000**
Total Self-Efficacy	13.72	2	.000**

*p<.05 **p<.01

As stated, the results provided in Table 3 and Table 6 indicated some differences among groups at pre-treatment therefore analyses of covariance (ANCOVA) were conducted on all post-training measures with these demographics and pre-training variables serving as covariates. The results revealed significant differences on all self-efficacy scales among groups at post-training (See Table 7).

TABLE 7

Results of Post-Training Self-Efficacy (ANCOVA)

Variable	F	df	P value
General PC Self-Efficacy	8.30	2	.000**
Word Self-Efficacy	6.57	2	.002**
Excel Self-Efficacy	17.84	2	.000**
Notes Self-Efficacy	17.84	2	.000**
Total Self-Efficacy	41	2	.000**

*p<.05 **p<.01

Table 8 illustrates the differences between groups for pre-and post-training for General PC Self-Efficacy Totals. Group 1, the instructor-led group increased significantly from the pre-training measures. Post-hoc analyses revealed that the two treatment groups obtained higher post-treatment scores than did the control group. The former two groups did not differ.

TABLE 8

Summary Statistics of General PC Self-Efficacy Totals by Measure

		Pre-training		Post-training	
	N	M	SD	M	SD
Group 1 (IL)	45	41.311	10.357	44.800	6.542
Group 2 (M)	44	43.773	7.938	44.636	7.002
Group 3 (C)	41	41.073	9.593	41.098	9.586

N=Number of subjects

Viewing the results of Table 9, a similar increase in the levels of self-efficacy occurred at post-training for the Word totals. The instructor-led group's mean scores increase by +9.38 and the standard deviation decreases by 5.97. There was a slight insignificant change in the self-directed training group post-training, but no change in the control group. Post-hoc analyses of post-treatment scores suggested that pre-post treatment changes were significant for the experimental groups, but not for the control group. These results provide information reaffirming that any type of training will increase computer self-efficacy when compared to no training; nevertheless, instructor-led training will provide a greater increase in computer self-efficacy. The mean scores of instructor-led subjects in the Word self-efficacy totals both pre- and post-training were lower than the subjects in the other two groups. Although, their was a larger increase in the Word self-efficacy for instructor-led training, it should be noted that the subjects did begin at a lower level of confidence to complete the skills related to the Microsoft Word (See Table 9).

TABLE 9

Summary Statistics of Word Self-Efficacy Totals by Measure

		Pre-training		Post-training	
	N	M	SD	M	SD
Group 1 (IL)	45	116.02	41.96	125.40	35.99
Group 2 (M)	44	129.07	31.40	132.18	30.35
Group 3 (C)	41	125.32	33.45	125.80	33.45

N=Number of subjects

The summary statistics of Excel Self-Efficacy Totals between groups (Table 10) provide results similar to the previous tables. The level of efficacy when completing the Microsoft Excel tasks were found to increase in the instructor-led group. There was a slight modification in the self-directed group, with little change in the control group. The instructor-led group's scores were found to be lower in both pre-and post-training when compared with the other two groups, (pre-94.82, post 105.60); however, the change in self-efficacy related to Microsoft Excel was significant for the instructor-led group.

TABLE 10

Summary Statistics of Excel Self-Efficacy Totals by Measure

		Pre-training		Post-training	
	N	M	SD	M	SD
Group 1 (IL)	45	94.82	41.32	105.60	40.93
Group 2 (M)	44	112.84	33.79	116.25	34.26
Group 3 (C)	41	112.39	39.97	112.46	39.78

N=Number of subjects

Table 11 demonstrates the differences between groups pre- and post-training for Notes self-efficacy totals. One of the most interesting difference which occurs between the measures in this table is the beginning scores for the instructor-led groups (M-114.71). Again, the mean scores for this group are considerably lower

than the other two groups. This may demonstrate a pattern that people who tend to feel less confident in completing a skill will be more encouraged to have an instructor assist them. The levels in self-efficacy do increase the most with the instructor-led group in this particular topic as well, which is significant according to post-hoc analysis. The mean score in the instructor-led group increases by 26.69.

TABLE 11

Summary Statistics of Notes Self-Efficacy Totals by Measure

		Pre-training		Post-training	
	N	M	SD	M	SD
Group 1 (IL)	45	114.71	64.99	141.40	59.93
Group 2 (M)	44	151.52	49.86	155.11	49.45
Group 3 (C)	41	155.51	53.84	156.37	53.40

N=Number of subjects

Finally, Total Self-Efficacy scores are described in Table 12. The largest variation occurs with the instructor-led group. The mean scores differ by +50.3 with a decrease in the standard deviation by 24.9. The self-directed group did increase slightly with a mean score change of +11. The control group had an increase of mean scores +1.4. These differences are significant according to post-hoc analyses. Although there was an increase in total self-efficacy for all three groups, the instructor-led group exhibited the greatest increase. This provides evidence for this study in support of the hypothesis that instructor-led training will be associated with significant changes in computer self-efficacy when compared to self-directed training and no training. Moreover, it provided evidence that any type of training either instructor-led or self-directed will increase one's level of self-efficacy when compared to a control group.

TABLE 12

Summary Statistics of Total Self-Efficacy Totals by Measure

		Pre-training		Post-training	
	N	M	SD	M	SD
Group 1 (IL)	45	366.9	145.1	417.2	120.2
Group 2 (M)	44	437.2	118.4	448.2	114.4
Group 3 (C)	41	434.3	132.5	435.7	132.2

N=Number of subjects

CHAPTER 5

DISCUSSION

The findings in this study support the hypothesis that instructor-led training will be associated with an increase one's level of self-efficacy. Moreover, the increase in self-efficacy occurs in each computer specific topic tested. Self-directed training, or requesting a training manual for study, does also appears to be associated with an increase in computer self-efficacy; however, across the various measures, the increase is not as large as in instructor-led training.

The positive affects of instructor-led training can be explained by many reasons. One reason may be that interacting with a teacher as well as with other students can create a great deal of positive reinforcement. Not only can the student learn from the teacher, but s/he can learn from the participation occurring within the classroom. With multiple students involved, particular questions may occur that may not have been thought of in individual study. Also, these questions or discussions can prepare the student for various situations.

A second reason instructor-led training can be so valuable to a person is the hands-on training. The student will learn from interacting on a computer with individual exercises. These exercises will allow the student to explore actual problems in search for the solution. Having a mistake occur on a computer can be

quite disheartening. In the classroom setting, the instructor will be able to assist the student through the procedures to remedy it.

Finally, a third positive attribute of instructor-led training is the teaching of variety. In today's computer age, there are so many ways of completing a task. In a class, the instructor can point out various methods to complete the tasks. The student can then choose which method would be most beneficial for the situation or for the personal work style. This variety empowers the student to choose what is simplest or fastest.

Together, these influences suggest that instructor-led training has most of the essential components for enhancing one's self-efficacy beliefs. Instructor-led training encompasses three of the four sources necessary to develop self-efficacy (modeling, direct experience, and verbal persuasion). The actual demonstration by the instructor coupled with hands-on computer use and feedback demonstrates an ideal learning environment. In comparison, the self-directed training allows for direct experience when using the computer; however, it does not provide opportunity for modeling nor persuasive feedback.

This particular study allowed for an examination of various groups. Although the differences among groups were controlled for, one important demographic variable must be addressed. The instructor-led students appeared to have lower mean scores pre-treatment than the self-directed and control groups. This may be why the students enrolled in training in the first place. Their lower levels of computer self-efficacy may encourage them to take advantage of a

developed training program. A topic for future study may be how people are motivated to enroll in certain training programs. Furthermore, why are they motivated (i.e. self-satisfaction, monetary need)?

Also, of particular interest in this study is the change in mean scores and standard deviations pre-post training in the instructor-led group. In all computer self-efficacy topics, the mean scores were increased and the standard deviation measurements were lowered. This was revealed to be true for all subsections. The group seemed to become more uniform. Their levels of self-efficacy appeared to resemble their peers. This can be related to the like topics and exercises the students were learning within the instructor-led training environment; moreover, the learning environment itself could be provoke the similar levels of self-efficacy. It also demonstrates how powerfully instructor-led training can influence computer self-efficacy.

In this study, instructor-led training has been supported as a positive influence in increasing computer self-efficacy. In studies to come, individual modes of training need to be addressed. Although there is a great deal of documentation on individual learning styles and training methods, there does not seem to be any actual research in the training classroom. How a person learns can affect how s/he will respond to training. Also, how an instructor trains can affect how a student will respond to training. Does the trainer present the matter in a such a fashion which is conducive to learning? Does the instructor provide a comfortable

environment to encourage the student to participate effectively? These topics need to be approached in future studies.

Future application of this study can be made to develop corporate training programs where one is not already in place. For corporations who may already have a training program(s), modifications may be made to provide additional instructor-led training sessions versus other alternative training strategies.

The demand to provide training in today's computer society is crucial. By creating training programs for one's employees, a great deal of work-related stress and anxiety can be relieved. This in turn will provide better performance on the job.

APPENDIX A

APPROVAL LETTER FOR THESIS STUDY AT AON CORPORATION

Aon Corporation
123 North Wacker Drive
Chicago, Illinois 60606
312/701-3040

John J. O'Connell
Executive Vice President
Aon Information Services

AON

August 14, 1997

Ms. Carolyn T. Conry
328 W. Dickens #17
Chicago, IL 60614

Dear Carolyn:

Subject: Request for Thesis Study at Aon

I welcome this study as an opportunity to assess the relative effectiveness of the various modes of training used at Aon, especially insofar as computer skills are involved.

If possible, I would like this handled as an Aon project under your control, with you having the freedom to use all information gathered to prepare your thesis. I would expect some feedback that would help Aon improve our training efforts going forward.

Sincerely,

John J. O'Connell

pa

APPENDIX B

INSTRUCTIONS

Instructions

The purpose of this study is to learn more about the effectiveness of our computer training programs so that improvements can be made. It is being conducted as masters thesis research by Ms. Carolyn Conry in the Department of Counseling Psychology at Loyola University Chicago. The packet contains two questionnaires that will be used for these purposes. Please fill them out in the order that they are arranged in the packet. The first questionnaire asks questions about your confidence in competing a variety of computer tasks. There are no right or wrong answers so we ask that you answer each questionnaire as completely as possible. It should take you no more than 20 minutes to complete both questionnaires.

Please be assured that your answers will be kept in strictest confidence. In fact, we ask that you do not place your name on either of the questionnaires, but instead provide only the last four digits of your social security number for purposes of data entry.

You are free to discontinue your participation at any time without prejudice.

If you have any questions about this study, please contact Ms. Carolyn Conry at the number or e-mail address listed below.

Thank you for your participation in this study.

Ms. Carolyn Conry
Masters Student
Department of Counseling Psychology
Loyola University Chicago
Telephone: (312) 701-4708
E-Mail: cconry@aon.com

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Thesis Director
Department of Counseling Psychology
Loyola University Chicago
Telephone: (847) 853-3304
E-Mail: sbrown@luc.edu

APPENDIX C

BACKGROUND QUESTIONNAIRE

Background Questionnaire

Please answer the following questions as completely as possible:

1. Sex (Check One):

   _____Male

   _____Female

2. Age:_____

3. Education (Check the highest level you have attained) :

   ____ High School

   ____ Associate Degree (2 year college degree)

   ____ Bachelors Degree (4 year college degree)

   ____ Masters Degree

   ____ Doctorals Degree

   ____ Other Professional or Technical Degree (Please Specify:

   _____)

4. Prior Computer Experience (Check one):

   ____ Never Use

   ____ Seldom Use (about once a week)

   ____ Frequently Use (about three times a week)

   ____ Always Use (almost every day)

5. Please circle a number on the scale below to indicate how anxious you feel about using computers.

1	2	3	4	5
Not At All Anxious		Moderately Anxious		Very Anxious

6. Please circle a number on the scale below to indicate generally how competent you feel as a computer user.

1	2	3	4	5
Not At All Competent		Moderately Competent		Very Competent

7. Please circle a number on the scale below to indicate how motivated you are to improve you computer skills.

1	2	3	4	5
Not At All Motivated		Moderately Motivated		Very Motivated

8. Please indicate which class you are registered for now:

_____

9. How many prior classes have you taken:_____

10. Finally, what was your primary reason for taking this course:

_____

APPENDIX D

COMPUTER SELF-EFFICACY SURVEY

COMPUTER SELF-EFFICACY SURVEY

Please circle a number indicating how confident you are that you could complete each of the following computer tasks successfully. Provide a rating for each task using the following scale:

1 2 3 4 5 6 7 8 9 10

No Confidence At All — Complete Confidence

General PC

1. powering on/off a computer	1	2	3	4	5	6	7	8	9	10
2. using the keyboard to perform specific functions	1	2	3	4	5	6	7	8	9	10
3. manipulating a mouse	1	2	3	4	5	6	7	8	9	10
4. identifying the hard drive (C:)	1	2	3	4	5	6	7	8	9	10
5. accessing the 3 ½ floppy drive	1	2	3	4	5	6	7	8	9	10

Microsoft Word

1. starting the Microsoft Word program	1	2	3	4	5	6	7	8	9	10
2. creating a simple letter or memo	1	2	3	4	5	6	7	8	9	10
3. editing text within a document	1	2	3	4	5	6	7	8	9	10
4. saving a document to a specific drive	1	2	3	4	5	6	7	8	9	10
5. opening a saved document	1	2	3	4	5	6	7	8	9	10
6. formatting a document	1	2	3	4	5	6	7	8	9	10
7. cutting/copying and pasting text	1	2	3	4	5	6	7	8	9	10
8. print previewing a document	1	2	3	4	5	6	7	8	9	10
9. printing a document	1	2	3	4	5	6	7	8	9	10
10. using Spellcheck	1	2	3	4	5	6	7	8	9	10
11. inserting graphics into a document	1	2	3	4	5	6	7	8	9	10
12. creating a table	1	2	3	4	5	6	7	8	9	10
13. setting margins for a document	1	2	3	4	5	6	7	8	9	10
14. switching from portrait to landscape	1	2	3	4	5	6	7	8	9	10
15. adding numbers and bullets	1	2	3	4	5	6	7	8	9	10
16. using tabs and indents	1	2	3	4	5	6	7	8	9	10

Microsoft Excel

1. Starting the Microsoft Excel program	1	2	3	4	5	6	7	8	9	10
2. creating a basic spreadsheet	1	2	3	4	5	6	7	8	9	10
3. editing text in a spreadsheet	1	2	3	4	5	6	7	8	9	10
4. entering formulas	1	2	3	4	5	6	7	8	9	10
5. using functions in a spreadsheet	1	2	3	4	5	6	7	8	9	10
6. saving a file to specific drive	1	2	3	4	5	6	7	8	9	10
7. formatting cells within a spreadsheet (bold, font)	1	2	3	4	5	6	7	8	9	10
8. applying borders and shading to a spreadsheet	1	2	3	4	5	6	7	8	9	10
9. resizing columns or rows	1	2	3	4	5	6	7	8	9	10
10. navigating within a large spreadsheet	1	2	3	4	5	6	7	8	9	10
11. changing paper orientation	1	2	3	4	5	6	7	8	9	10
12. printing previewing a document	1	2	3	4	5	6	7	8	9	10
13. printing a document	1	2	3	4	5	6	7	8	9	10
14. creating a chart	1	2	3	4	5	6	7	8	9	10

15. using multiple worksheets	**1 2 3 4 5 6 7 8 9 10**

COMPUTER SELF-EFFICACY SURVEY

Please circle a number indicating how confident you are that you could complete each of the following computer tasks successfully. Provide a rating for each task using the following scale:

1 2 3 4 5 6 7 8 9 10

No Confidence At All — Complete Confidence

Email

1. Starting the Email program	**1 2 3 4 5 6 7 8 9 10**
2. creating message (new memo)	**1 2 3 4 5 6 7 8 9 10**
3. formatting the message	**1 2 3 4 5 6 7 8 9 10**
4. addressing a message to one person	**1 2 3 4 5 6 7 8 9 10**
5. addressing a message to multiple people	**1 2 3 4 5 6 7 8 9 10**
6. customizing delivery options for a message	**1 2 3 4 5 6 7 8 9 10**
7. sending a message	**1 2 3 4 5 6 7 8 9 10**
8. reading a received message	**1 2 3 4 5 6 7 8 9 10**
9. replying to a message	**1 2 3 4 5 6 7 8 9 10**
10. forwarding a message to another person(s)	**1 2 3 4 5 6 7 8 9 10**
11. adding an attachment to a message	**1 2 3 4 5 6 7 8 9 10**
12. viewing an attachment	**1 2 3 4 5 6 7 8 9 10**
13. creating folders within your mailbox	**1 2 3 4 5 6 7 8 9 10**
14. moving document to a folder	**1 2 3 4 5 6 7 8 9 10**
15. printing a message	**1 2 3 4 5 6 7 8 9 10**
16. deleting a message	**1 2 3 4 5 6 7 8 9 10**
17. creating a group within your address book	**1 2 3 4 5 6 7 8 9 10**
18. creating a person's profile within your address book	**1 2 3 4 5 6 7 8 9 10**
19. sending a message to a person outside of your company (via Internet)	**1 2 3 4 5 6 7 8 9 10**
20. receiving a message from a person outside of your company (via Internet)	**1 2 3 4 5 6 7 8 9 10**

APPENDIX E

INSTRUCTIONS PART II

Instructions Part II

Please follow the instructions specified for the group you are participating in:

Instructor-Led Training	Complete the second survey immediately after training
Manual Training	Complete the second survey one week after receiving the manual
Self-Study Training	Complete the second survey one week after using a computer following your self-study

Once you have completed both sets of surveys, please place them in the pre-addressed envelope and mail them. DO NOT provide a return address.

If you have any questions about this study, please contact Ms. Carolyn Conry at the number or e-mail address listed below.

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APPENDIX F

CODE SHEET

Code Sheet

Background Questionnaire

Variable	Code(s)	Pre	Post
Subject No.	01-075		
Group	1=IL 2=M 3=C		
Sex	1=Male 2=Female		
Age	1-100		
Education	1=High School 2=Associate Degree 3=Bachelors Degree 4=Masters Degree 5=Doctorals Degree 6=Other Professional or Technical Degree		
Prior Computer Experience	1=Never Use 2=Seldom Use (about once a week) 3=Frequently Use (about three times a week) 4=Always Use (almost every day)		
Level of Anxiety When Using Computers	1=Not At All anxious 2= 3=Moderately Anxious 4= 5=Very Anxious		
Competent As A Computer User	1=Not At All Competent 2= 3=Moderately Competent 4= 5=Very Competent		

Background Questionnaire

Variable	Code(s)	Pre	Post
Motivated to Improve Computer Skills	1=Not At All Motivated 2= 3=Moderately Motivated 4= 5=Very Motivated		
Class/Manual Registered For:	1=Microsoft Word 2=Microsoft Excel 3=Lotus Notes 4=Not applicable (randomly assigned)		
Number of Prior Classes Taken:	0=0 classes 1=1 class 2=2 classes 3=3 classes 4=4 classes 5=Not applicable (randomly assigned)		
Primary Reason for Taking Course:	0=Not applicable 1=To learn software 2=Other's suggestion (supervisor, manager) 3= Improve skills 4=Use in job 5=Job promotion		

Computer Self-Efficacy Survey

Variable	Code(s)	Pre	Post
General PC			
Powering on/off a computer	1....10		
Using the keyboard	1....10		
Manipulating a mouse	1....10		
Identifying the hard drive	1....10		
Accessing the 3 1/2 floppy drive	1....10		
Microsoft Word			
Starting the Microsoft Word program	1....10		
Creating a simple letter or memo	1....10		
Editing text within a document	1....10		
Saving a document to a specific drive	1....10		
Opening a saved document	1....10		
Formatting a document	1....10		
Cutting/copying and pasting text	1....10		
Print previewing a document	1....10		
Printing a document	1....10		
Using Spellcheck	1....10		
Inserting graphics into a document	1....10		
Creating a table	1....10		
Setting margins for a document	1....10		
Switching from portrait to landscape	1....10		
Adding numbers and bullets	1....10		
Using tabs and indents	1....10		
Microsoft Excel			
Starting the Microsoft Excel program	1....10		
Creating a basic spreadsheet	1....10		
Editing text in a spreadsheet	1....10		
Entering formulas	1....10		
Using functions in a spreadsheet	1....10		
Saving a file to a specific drive	1....10		
Formatting cells within a spreadsheet	1....10		
Applying borders and shading to a spreadsheet	1....10		
Resizing columns or rows	1....10		
Navigating within a large spreadsheet	1....10		
Changing paper orientation	1....10		
Print Previewing a document	1....10		
Printing a document	1....10		
Creating a chart	1....10		
Using multiple worksheets	1....10		

Computer Self-Efficacy Survey

Variable	Code(s)	Pre	Post
Email			
Starting the Email program	1....10		
Creating message (new memo)	1....10		
Formatting the message	1....10		
Addressing a message to one person	1....10		
Addressing a message to multiple people	1... 10		
Customizing delivery options	1....10		
Sending a message	1....10		
Reading a received message	1....10		
Replying to a message	1....10		
Forwarding a message	1....10		
Adding an attachment to a message	1....10		
Viewing an attachment	1....10		
Creating folders within your mailbox	1....10		
Moving document to a folder	1....10		
Printing a message	1....10		
Deleting a message	1....10		
Creating a group within your address book	1....10		
Creating a person's profile within your address book	1....10		
Sending a message outside (via Internet)	1....10		
Receiving a message from outside (via Internet)	1....10		

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VITA

The author, Carolyn T. Conry, was born December 23, 1970 in London, England to Mr. Ken Conry and Mrs. Paula Conry.

In May of 1993, Ms. Conry graduated from Indiana University in Bloomington, Indiana with a Bachelor's degree in Psychology. Her individual research focused on abused women and children. Throughout her years at Indiana, she volunteered as a childcare worker at United Methodist Church and Middleway Rape Crisis Center.

In August of 1993, Ms. Conry entered Loyola University of Chicago. Her practicum experience at Rush-Presbyterian St. Luke's Medical Center - Chicago reinforced her interests in abuse. During graduate school, Ms. Conry began working as a consultant teaching adult software classes. She also participated in the development of an adult educational program for economically disadvantaged people in the Uptown Community. It was at this time, that the focus of this study was developed.

Ms. Conry is a Master of Arts candidate for graduation in May 1998.

THESIS APPROVAL SHEET

The thesis submitted by Carolyn Conry has been read and approved by the following committee:

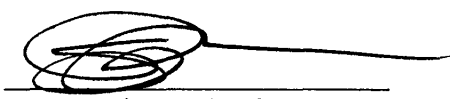
Steven Brown, Ph.D., Director
Professor of Psychology
Loyola University Chicago

Edward Quinnan, S.J., Ph.D.
Professor of Psychology
Loyola University Chicago

The final copies have been examined by the director of the thesis and the signature which appears below verifies the fact that any necessary changes have been incorporated and that the thesis is now given final approval by the committee with reference to content and form.

The thesis is therefore accepted in partial fulfillment of the requirements for the degree of Masters of Arts.

4/2/98
Date


Director's Signature